AN EXPERIMENT WITH ACID MINE WATER

AND

LIVING HISTORY – A COAL MINE INTERVIEW

"A TALK WITH HISTORY

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FOR

THE MON VALLEY EDUCATIONAL CONSORTIUM'S

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JULY 2000

AN EXPERIMENT WITH ACID MINE WATER

CONCEPT - WATER POLLUTION IS A SERIOUS ECOLOGICAL PROBLEM. IN SOUTHWESTERN PENNSYLVANIA ACID MINE WATER IS A MAJOR SOURCE OF POLLUTION. WATER IS A RENEWABLE RESOURCE BUT CONTAMINATES SUCH AS ACID MINE WATER MAKES PURIFICATION A LONG TERM PROJECT AND EXTREMELY DIFFICULT AND EXPENSIVE.

OBJECTIVES -

STUDENTS WILL CREATE A SAMPLE OF ACID MINE WATER.
STUDENTS WILL TEST pH AND IRON LEVELS.
STUDENTS WILL OBSERVE AND RECORD DATA.
STUDENTS WILL HYPOTHESIZE THE EFFECTS OF CONTAMINATED WATER ON LIVING THINGS.
STUDENTS WILL PURIFY ACID MINE WATER

MATERIALS NEEDED

THREE- 1 GALLON CLEAR JARS
10 LBS. OF CRUSHED COAL
10 LBS OF CRUSHED LIMESTONE
pH INDICATOR STRIPS
IRON INDICATOR STRIPS
VARIOUS BEDDING PLANTS: FLOWER
VEGETABLE
CATTAIL
TWO STICKS LONG ENOUGH TO STIR WATER (MARX EACH STICK FOR EACH JAR)
STRAINER- COFFEE FILTERS
A DRAWSTRING BAG
TEACHER NOTES

NOTE - ACID MINE DRAINAGE (AMD) IS THE RESULT OF PYRITE (FeS2) OXIDATION. PYRITE IS AN IRON DISULFIDE THAT IS COMMONLY FOUND IN STRATA SURROUNDING COAL WHEN THE LAND IS DISTURBED AND THE PYRJTE IS EXPOSED TO OXYGEN AND WATER, IT WEATHERS. THIS PRODUCTION OF IRON, SULFATE, AND ACIDITY CONTRIBUTES TO THE DEGRADATION OF STREAMS. THE WGH METAL CONTENT AND LOW pH MAKE TIES WATER UNSAFE FOR DRINKING AND DANGEROUS TO AQUATIC PLANTS AND ANIMALS.AMD IS FOUND COMMONLY AS ORANGE WATER WITH ORANGE PRECIPITATE NEARBY.

NOTE - pH ISA MEASURE OF HOW ACIDIC/BASIC WATER IS. THE RANGE GOES FROM 0-14, WITH 7 BEING NEUTRAL. pHS OF LESS THAN 7 INDICATE ACIDITY, WHEREAS A pH OF GREATER THAN 7 INDICATES

A BASE. pH IS REALLY A MEASURE OF THE RELATIVE AMOUNT OF FREE HYDROGEN AND HYDROXL IONS IN THE WATER. WATER THAT HAS MORE FREE HYDROGEN IONS IS ACIDIC, WHERE AS WATER THAT HAS MORE FREE HYDROXL IONS IS BASIC. SINCE pH CAN BE AFFECTED BY CHEMICALS IN THE WATER, pH IS AN IMPORTANT INDICATOR OF WATER THAT IS CHANGING CHEMICALLY. pH IS REPORTED IN 'LOGARITHMIC UNITS LIKE THE RICHTER SCALE, WHICH MEASURES EARTHQUAKES. EACH NUMBER REPRESENTS A 10-FOLD CHANGE IN THE ACIDITY BASICNESS OF THE WATER. WATER WITH A pH OF 515 TEN TIMES MORE ACIDIC THAN WATER HAVING A pH OF 6. POLLUTION CAN CHANGE A WATER'S pH, WHICH IN TURN CAN HARM ANIMALS AND PLANTS LIVING IN THE WATER. FOR INSTANCE, WATER COMING OUT OF AN ABANDONED COAL MINE CAN HAVE A pH OF 2, WHICH IS VERY ACIDIC AND WOULD DEFINITELY AFFECT ANY FISH CRAZY ENOUGH TO TRY TO LIVE N IT! BY USING THE LOGARITHM SCALE, MINE-DRAINAGE WATER WOULD BE 100,00 TIMES MORE ACIDIC THAN NEUTRAL WATER-- SO STAY OUT OF ABANDONED MINES!

STEP I CREATING THE ACID MINE WATER AND CONTROL SAMPLE

PLACE COAL N CONTAINER AND COVER WITH WATER.

FILL CONTROL CONTAINER WITH WATER.

TEST AND RECORD THE FOLLOWING INFORMATION pH LEVELS OF BOTH CONTAINERS, IRON LEVELS OF BOTH CONTAINERS, COLOR OF WATER IN BOTH CONTAINERS, ODOR OF WATER IN BOTH CONTAINERS
DO NOT DRINK THE WATER!
JAR 1 pH IRON COLOR ODOR
JAR 2 pH IRON COLOR ODOR

DO TIES EACH DAY UNTIL pH DROPS TO 4 OR BELOW. YOU ARE THEN READY TO MOVE ON TQ STEP II.

STEP II EFFECTS OF ACID MINE WATER ON THE ENVIRONMENT.

DIVIDE THE PLANTS INTO TWO GROUPS AND LABEL THEM JAR I AND JAR 2

WATER THE PLANTS AND MAKE AND RECORD OBSERVATIONS EACH DAY.

DISCUSSION WHAT DO YOU THINK WILL BE THE EFFECT ON EACH OF THE PLANTS? WHICH WILL DIE FIRST? HOW LONG WILL THIS TAKE? WHICH PLANTS WILL NOT DIE?

AS YOU DISCUSS THE QUESTIONS RECORD THAT STUDENTS ANSWERS. COMPARE THEIR ANSWERS TO WHAT ACTUALLY TAKES PLACE OVER THE NEXT FEW DAYS.

CONCLUSIONS .HAVE STUDENTS WRITE THEIR THE OBSERVATIONS AND THEIR CONCLUSIONS OF THE EFFECT OF ACID MINE WATER ON PLANTS AND ANIMALS THAT DEPEND ON THIS SOURCE OF WATER THAT HAS BECOME POLLUTED WITH ACID MINE WATER. REMEMBER DON'T DRINK THE WATER.

STEP 3- PURIFICATION OF ACID MINE WATER

PLACE LIMESTONE INTO THE STRING BAG

PLACE STRING BAG INTO THE THIRD CONTAINER

USING THE FILTER, STRAIN ACID MINE WATER INTO THIRD CONTAINER.

START TO MEASURE pH AND IRON LEVELS EACH DAY AND RECORD

HAVE STUDENTS RECORD THEIR OBSERVATIONS ON pH, IRON, WATER COLOR AND SMELL

AS pH LEVELS RISE AND IRON LEVELS DROP WATER IS BEING PURIFIED.

pH LEVEL 6 TO 9IS ACCEPTABLE

IRON LEVEL I MG!L IS ACCEPTABLE

REMOVE STRING BAG AND OBSERVE ANY CHANGES.

REMEMBER DO NOT DRINK THE WATER!

THE EXPERIMENT IS CONCLUDED

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OBJECTIVES:

1. THE STUDENTSS WILL ORGANIZE THOUGHTS INTO COHERENT QUESTIONS.

2. TEE STUDENTS WILL IMPROVE WRITTEN AND *VERBAL* SKILLS.

3. THE STUDENTS WILL WRITE A REPORT USING NOTES TAKEN DURING INTERVIEWS.

MATERIALS:

PERMISSION SUP

NOTE CARDS

PENCIL

OPTIONAL - TAPE RECORDER, VIDEO CAMERA

ACTIVITY:

1. STUDENTS WILL CONTACT A PERSON WHO WAS DTRECTLY INVOLED IN THE COAL INDUS TRY.

2. FILL OUT PERMISSION SLIP AND RETURN TO TEACHER.

3. DEVELOP A LIST OF QUESTIONS TO ASK THE INTERVIEWEE

4. CONDUCT THE INTERVIEW AT TEE SCHEDULED TIME.

5. FROM THE INTERVIEW NOTES, WFITE A REPORT ON WHAT TEE INITERVIE WEE SAID.

SAMPLE QUESTIONS:

1. WHAT IS YOUR ETHNIC BACKGROUND?

2. WHERE DID YOU FIRST LIVE IN THE AREA?

3. HOW MUCH EDUCATION DID YOU HAVE?

4. HOW OLD WERE YOU WHEN YOU STARTED IN THE MINE?

5. WHAT WAS THE NAME OF THE MINE AND WHERE WAS IT?

6. WHO OWNED THE HOUSE THAT YOU LIVED IN?

7. WHERE DID YOU SHOP?

8. WHAT WERE YOUR WAGES?

9. HOW OFTEN WERE YOU PAID?

10. HOW WERE YOU PAID?

11. DESCRIBE YOUR HOME

12. WHAT JOBS DID YOU HAVE IN THEE MINE?

13. WERE YOU EVER INJURED?

14. DESCRIBE YOU WORK DAY

l5. WHAT WAS THE GREATEST CHANGE YOU SAW IN COAL MINING?

16. DID UIONS DEVELOP SLOWLY OR RAPIDLY IN YOUR AREA?

17. DID YOU EVER CHANGE OCCUPATIONS?

18. WHAT WAS THE ETHNIC BREAKDOWN OF YOUR COMMUNITY?

19. WHAT IS YOUR MOST VIVID MEMMORY OF MINING?

20. WOULD YOU DO IT ALL OVER AGAIN?